

THAT WHICH IS CLAIMED:

1. A method of manufacturing rivets comprising:
providing a workpiece defining at least one region having a refined grain
5 structure;
removing a blank from the at least one region of the workpiece having a
refined grain structure; and
forming the blank into a rivet.
2. A method according to Claim 1 wherein said removing step comprises
10 punching the blank from the at least one region of the workpiece having a refined
grain structure.
3. A method according to Claim 1 wherein said providing step comprises:
determining the dimensions of the rivet;
selecting the workpiece based on the dimensions of the rivet; and
15 friction stir welding a portion of the workpiece to form the at least one region
having a refined grain structure.
4. A method according to Claim 1 wherein said providing step comprises
inserting a rotating friction stir welding probe into the workpiece to form the at least
one region having a refined grain structure.
- 20 5. A method according to Claim 4 further comprising moving the rotating
friction stir welding probe through the workpiece along a predetermined path.
6. A method according to Claim 1 wherein said forming step comprises
extruding the blank through a die.
7. A method according to Claim 1 wherein said forming step comprises
25 stamping the blank with a punch.
8. A method according to Claim 1 further comprising machining the
workpiece prior to the forming step to remove at least one region of the workpiece
having an unrefined grain structure.

9. A method according to Claim 1 further comprising repeating said removing and forming steps.

10. A method of manufacturing rivets comprising:
providing a workpiece;
5 forming in the workpiece at least one region having a refined grain structure;
and
subsequent to said first forming step, forming a rivet from the at least one region having a refined grain structure.

11. A method according to Claim 10 wherein said first forming step
10 comprises inserting a rotating friction stir welding probe into the workpiece.

12. A method according to Claim 11 further comprising moving the rotating friction stir welding probe along a predetermined path.

13. A method according to Claim 10 wherein said second forming step comprises:
15 removing a blank from the at least one region of the workpiece having a refined grain structure; and
forming the blank into a rivet.

14. A method according to Claim 13 wherein said removing step comprises punching the blank from the at least one region of the workpiece having a
20 refined grain structure.

15. A method according to Claim 13 wherein said third forming step comprises extruding the blank through a die.

16. A method according to Claim 13 wherein said third forming step comprises stamping the blank with a punch.

25 17. A method according to Claim 10 further comprising machining the workpiece prior to said second forming step to remove at least one region of the workpiece having an unrefined grain structure.

18. A method according to Claim 10 further comprising repeating said second forming step.

19. A rivet comprising:
a shank having a head at one end thereof; and
5 wherein said shank and said head substantially comprise a grain structure having a grain size less than about 5 microns.

20. A rivet according to Claim 19 wherein said shank and said head comprise a material selected from the group consisting of aluminum, an aluminum alloy, titanium, and a titanium alloy.

10 21. A rivet according to Claim 19 wherein the end of said shank opposite said head is adapted to be upset to form a second head.

22. A structural assembly, comprising:
a first structural member;
a second structural member positioned adjacent to said first structural member
15 to thereby define an interface therebetween; and
at least one rivet at least partially joining said first and second structural members along said interface and wherein said at least one rivet substantially comprises a refined grain structure having a grain size less than about 5 microns.

23. A structural assembly according to Claim 22 wherein said first
20 structural member and said second structural member comprise dissimilar materials.

24. A structural assembly according to Claim 22 wherein said first and second structural members comprise the same material.

25. A structural assembly according to Claim 22 wherein said at least one rivet comprises a material selected from the group consisting of aluminum, an
25 aluminum alloy, titanium, and a titanium alloy.

26. A structural assembly according to Claim 22 wherein at least one of said first and second structural members comprises a material selected from the group consisting of aluminum, an aluminum alloy, titanium, and a titanium alloy.

27. A structural assembly according to Claim 22 further comprising an elongate weld joint joining said first and second structural members at least partially along said interface.

28. A structural assembly according to Claim 27 wherein said elongate
5 weld joint at least partially consumes at least one of said at least one rivets.

29. A structural assembly according to Claim 27 wherein said elongate weld joint comprises a weld joint selected from the group consisting of an arc weld joint, resistance weld joint, gas weld joint, and friction stir weld joint.